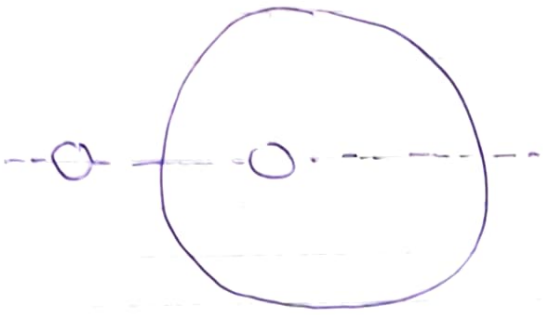
MERCURE
HOTEL
BUDAPEST CASTLE HILL

Problem 2



- spherical asteroid
- Ceres size $R_a = 1000$ km
- transiting a Sun

Q1) what fraction of light is removed by the asteroid transit?

before transit $\quad F_{before} = B_s \overbrace{\pi R_s^2}^{\text{surface emitting}}$

← star blackbody emission or flux density

in transit $\quad F_{transit} = B_s \pi R_s^2 - B_s \pi R_a^2$

Normalized $\quad \Delta = \dfrac{F_{before} - F_{transit}}{F_{before}} = \boxed{\dfrac{R_a^2}{R_s^2}} \propto 10^{-6}$

Q2) Assume JWST has a 30 ppm uncertainty on this signal, (what is the ~~SNR~~ signal to noise of this observation) can we detect this asteroid?

$$SNR = \frac{10^{-6}}{30 \cdot 10^{-6}} \propto 0.03 \; !$$

an SNR about 5 is required

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